

Indiana State of the Environment Report

Water Quality



Photo by Richard Fields, Indiana Department of Natural Resources.

Clean water is a precious resource that Hoosiers do not take for granted, whether studying water ecology at the Falls of the Ohio State Park in southern Indiana, sailing on Lake Monroe or drinking from a well on a northern Indiana farm.

Water quality

Water pollution

Water sustains life, supports commerce and agriculture, and provides recreation and enjoyment. We depend on both surface and ground water for our drinking water. Indiana's beaches, rivers and lakes are popular destinations for recreation. Industry and commerce rely on Indiana's plentiful water supply to make steel, electricity and many other products.

Every time it rains or the snow melts, water carries pollutants from the air and land into surface and ground water. Some pollutants break down in the environment, but others persist and accumulate in fish, shellfish and other aquatic organisms or become trapped in river and lake beds for many years.

Water pollution sources are classified as point or nonpoint. Point sources of pollution have a known discharge point such as a pipe or sewer. An example of a point source discharger is an industrial wastewater treatment plant that discharges treated water directly into a stream.

Nonpoint source pollution refers to water pollution that results from activities such as soil erosion, agriculture, urban runoff, land development and air pollution deposits. Nonpoint pollution sources are often challenging to identify, measure and control.

Ground water-Water found below the surface where holes, cracks and spaces between rocks and soil are filled with water.

Surface water-Natural and artificial accumulations of water on the land surface.

Indiana's most harmful water pollutants

- Pathogens such as *E. coli*
- Oxygen-depleting nutrients such as fertilizers, untreated sewage and manure
- Chemical contaminants such as polychlorinated biphenyls, pesticides and metals
- Siltation from soil erosion

Typical contamination sources

- Municipal point sources
- Agricultural activities
- Industrial point sources
- Combined sewer overflows
- Resource extraction
- Habitat alterations
- Land disposal (landfills and land application of sewage sludge)

for more details
visit water @

www.state.in.us/iden/soe/99report/water

Drinking water

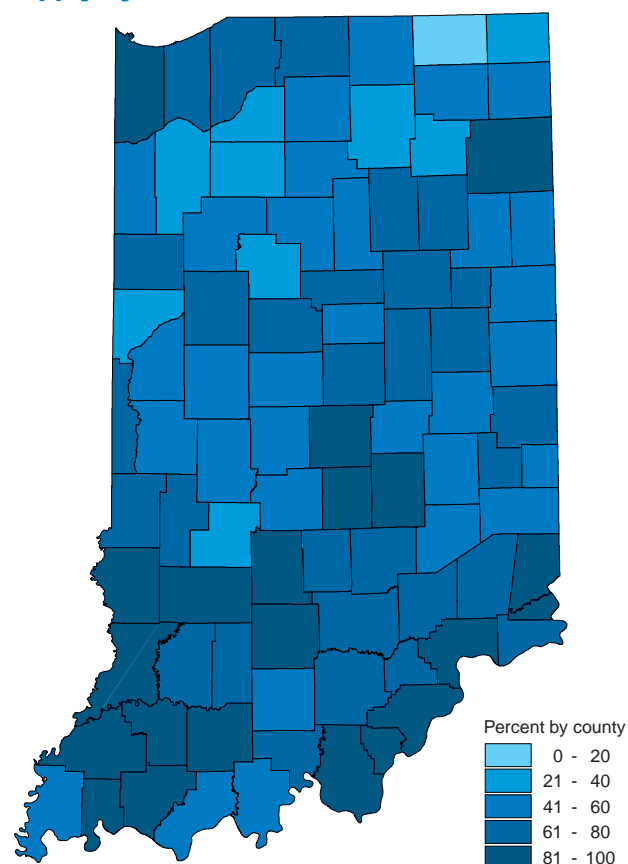
Seventy-five percent of Hoosiers get their drinking water from community public water supply systems, up from 70 percent in 1970. As might be expected, Hoosiers living in urban areas are more likely to use public drinking water than those in rural areas who are more likely to use private wells.

Public drinking water systems in Indiana

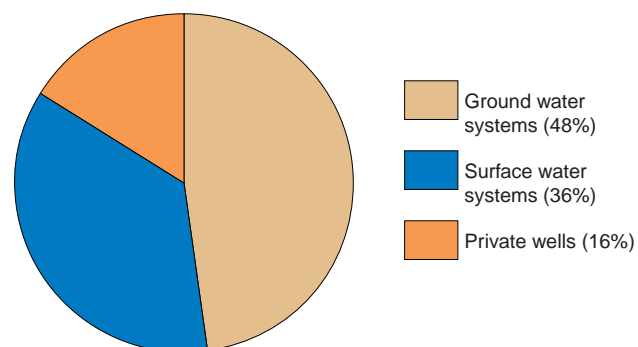
Indiana has more than 4,000 active community public water supply systems. These range from large community systems serving urban areas to small, seasonal campgrounds and include the approximately 900 public drinking water systems that serve residential and commercial customers year-round.

Indiana's community water systems obtain their water from ground water sources via wells or surface water sources such as lakes, rivers or reservoirs. Eighty percent of the community water systems in Indiana obtain their water from ground water sources. The remaining 20 percent of community water systems, including many of Indiana's largest urban areas, draw from surface water.

Households served by public drinking water supply systems



Households served by system type



Source: IDEM Office of Water Management, 1998

Threats to drinking water

Contaminants can enter drinking water supplies from various sources. For example, contaminants can move from the land into ground water or be carried to lakes and streams. During rainfall, combined sewers may discharge untreated sewage into rivers that are sources for drinking water. Community public water suppliers must properly treat and disinfect water which may contain bacteria and nitrates. These contaminants pose the most immediate health risks.

Violations of drinking water standards

The U.S. Environmental Protection Agency (EPA) has established drinking water standards for 77 contaminants.[†]

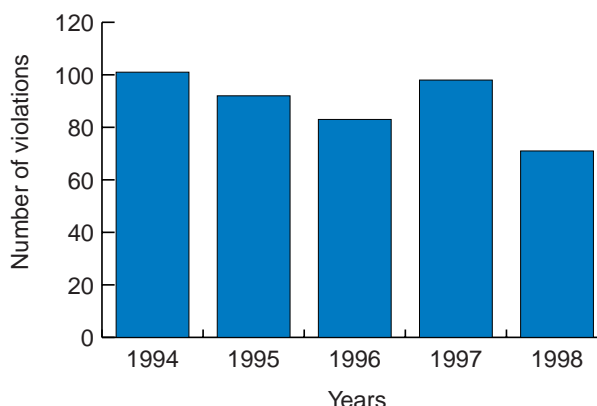
If a public water system exceeds a standard, fails to properly treat or does not test according to schedule, the water supplier must notify its customers of the violation and work to correct the problem.

In 1998, 93 percent of the 891 community public water systems met all drinking water health standards. This is an improvement of four percentage points from 1997. Bacteria was the most common contaminant found in the 62 noncompliant systems.

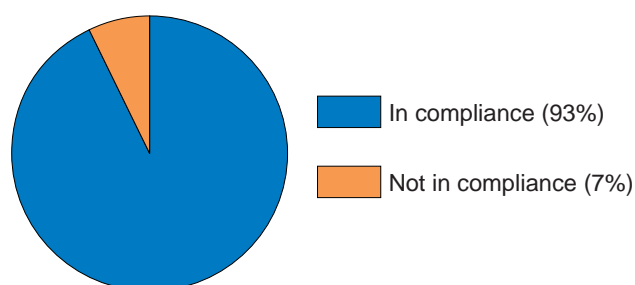
Two consecutive periods of the same violation, such as a nitrate or a bacteria violation, a system in significant noncompliance. In 1994, over 450,000 people in Indiana obtained drinking water from systems in significant noncompliance. This number has dropped dramatically since then, and in 1998, less than 12,000 people were served by systems in significant noncompliance.

[†] The number of EPA drinking water standards for contaminants was reported incorrectly in the *1998 State of the Environment Report* as 73. The correct number is 77.

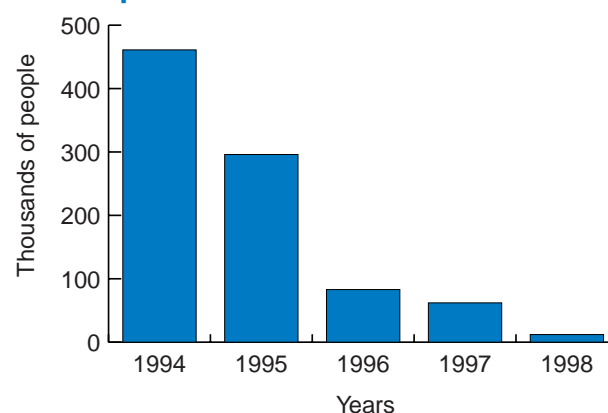
Drinking water standard violations Community public water supply systems



1998 drinking water standards compliance Community public water supply systems



Population served by systems in significant noncompliance



Source: IDEM Office of Water Management, 1998

Ground water

Ground water is the water found below the surface where holes, cracks and spaces between rocks and soil are filled with water. Forty-eight percent of the population served by public drinking water systems depends on ground water. In addition to public water systems, more than 500,000 Indiana homes use private wells and ground water systems for their water supply.

Ground water also supports Indiana's economy as a source of water for industrial and agricultural uses. In 1998, Indiana used approximately 250 billion gallons of ground water, 10 percent more than in 1986.

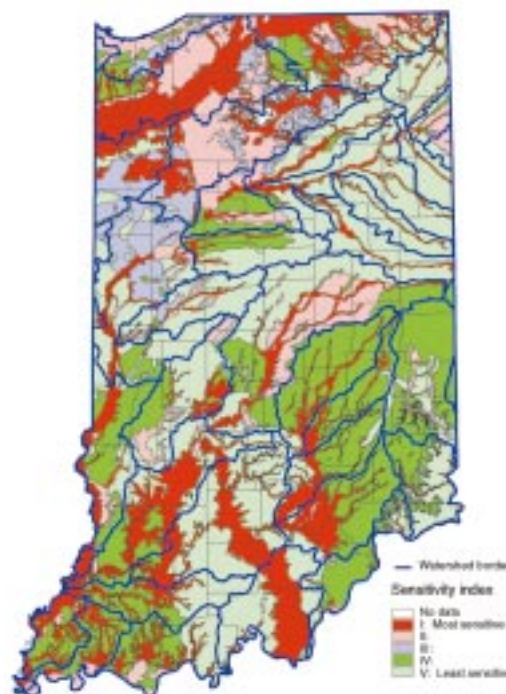
Ground water highly susceptible to contamination

Once contaminated, ground water is difficult to clean, requiring many years and great expense. Protecting ground water from possible pollution sources makes more sense.

Some ground water is more susceptible to contamination because of the kind of soils and rocks above it. In some cases, the ground water is so close to the surface that pollutants do not have far to travel. In other cases, soils above the ground water are porous and pollutants can move quickly.

Ground water sensitivity indexes, such as the map to the right, are valuable tools in source water assessments for community public water supply systems. Ground water sensitivity indexes help define the relationship between geology and ground water and provide a better understanding of the flow system between ground and water.

Ground water sensitivity index



This map is a work in progress between IDEM and the Indiana Geological Survey.

Source: Indiana Geological Survey, 1998

Wetlands

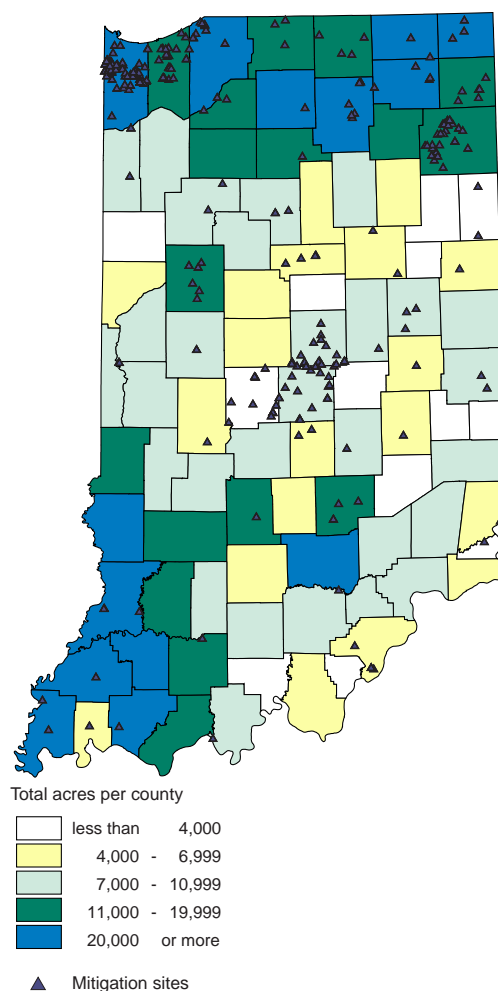
Wetlands are areas of land that typically are wet or flooded part of the year, have soils formed under wet conditions and support vegetation suited for life in saturated soil conditions.

Wetlands are important because they improve water quality, provide flood protection, shoreline erosion control and habitats for fish and wildlife. When European settlers arrived, Indiana had an estimated 5.6 million acres of wetlands. Since then, more than 85 percent of Indiana's wetland acreage has been drained and converted to farmland and urban areas.

Wetland mitigation

Wetland mitigation is the creation or restoration of a wetland to counter the loss of wetland acreage and function. In January 1998, IDEM and EPA initiated a series of studies to evaluate wetland regulation and mitigation, identify potential problems and formulate solutions. Interim results reveal construction status for 296 mitigation sites required between 1986 to 1996. During this time period, 190 mitigation sites had been constructed, 62 sites had been partially constructed, and no action had been taken on 44 sites.

Indiana wetlands



Source: *Indiana Water Quality Report (acres), 1998; Construction Rate of Wetland Compensatory Mitigation in Indiana (mitigation sites), 1998*

Surface water quality

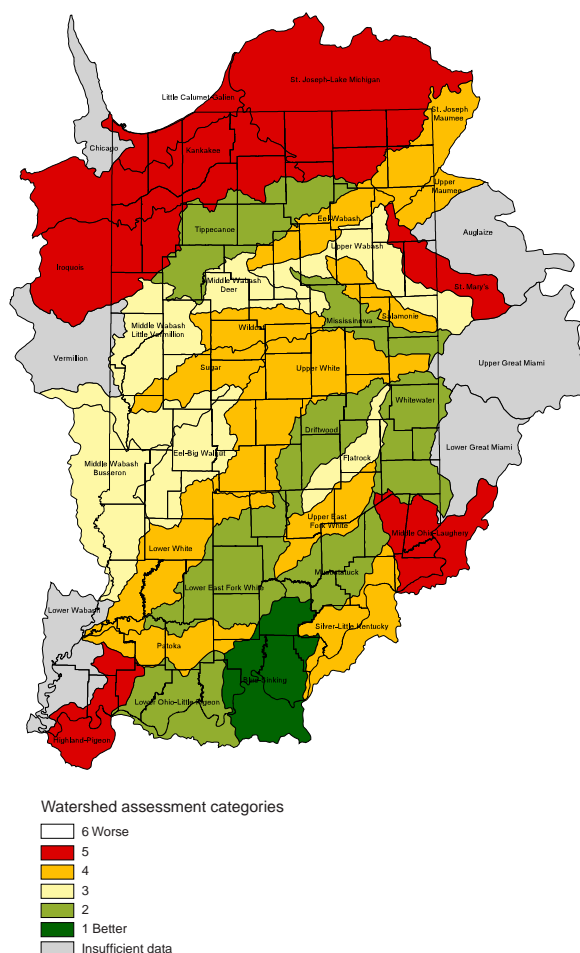
Indiana is divided into 41 watersheds, many of which extend into neighboring states. These watersheds contain approximately 36,000 stream miles and drain into the state's nine major drainage basins. Also, more than 600 publicly owned inland lakes and reservoirs cover more than 106,000 acres within the basins. The quality of the waterways varies greatly from severely degraded by pollution to clean enough for fishing, swimming or for use as a drinking water supply.

Surface water data used in this report

Indiana streams and lakes are monitored year-round and assessed every five years. The Surface Water Quality Monitoring Strategy (revised 1998) is designed to provide technical data and information for identifying impaired streams and lakes in Indiana. Section 305(b) of the Clean Water Act requires states to prepare and submit a water quality assessment report of state water resources every two years. The most recently published report is the *Indiana 305(b) Report, 1994-95*. 1996 and 1997 information was submitted to EPA in 1998.

In 1998, IDEM's Office of Water Management and the Natural Resources Conservation Service led the first Unified Watershed Assessment (UWA) of Indiana watersheds. The results of this assessment identify Indiana watersheds that do not meet Clean Water Act or other natural resource goals. Data from the UWA, the Surface Water Quality Monitoring Strategy and other sources are used to assess the basins, watersheds, streams and lakes profiled on the following pages in this chapter.

Indiana watersheds



Source: IDEM Office of Water Management, 1999

Watershed

A land area that drains into a lake or river and its tributaries.

Basin

A large watershed or group of watersheds such as the Great Lakes and Ohio River basins.

For the purposes of this *1999 State of the Environment Report*, basins within the state highlight groups of individual watersheds.





Guide to the assessment of the basins



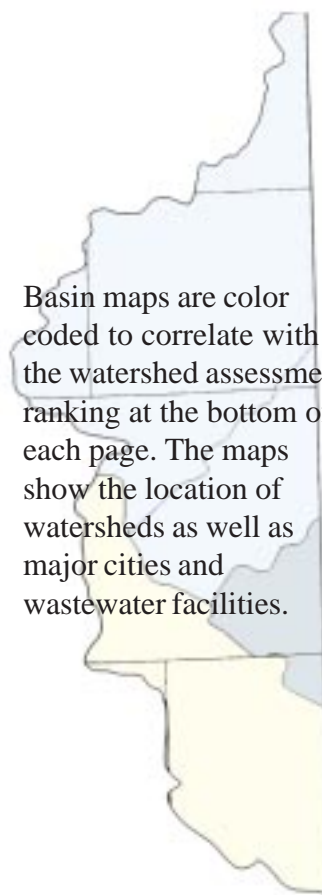
Use this page as a general guide to the nine basin summaries that follow. The introduction on each page describes the basin's location and its main tributaries.

Major wastewater facilities

Each page shows the number and location of large facilities permitted to discharge to surface waters within the basin.

-  **Electrical**-Large power plants that generate electricity and require water for cooling.
-  **Government**-Major state or federally owned sites such as correctional facilities and military bases.
-  **Industrial**-Major industries with significant amounts of wastewater treatment discharge.
-  **Municipal**-Major wastewater treatment plants that discharge more than 1 million gallons per day.

Basin maps are color coded to correlate with the watershed assessment ranking at the bottom of each page. The maps show the location of watersheds as well as major cities and wastewater facilities.



Basin quality rating

Aquatic life support (% of total stream miles assessed for aquatic life support)



Provides suitable water quality for protection and propagation of desirable aquatic life.



Does not provide suitable water quality for protection and propagation of desirable aquatic life.

Recreational uses (% of total stream miles assessed for recreational uses)



People can swim in water without risk of adverse health effects, such as catching a waterborne disease from raw sewage contamination.



People swimming in water risk adverse health effects, such as catching a waterborne disease from raw sewage contamination.

Watersheds assessment ranking key

Watershed	Total miles	Miles assessed	Overall quality					
Watershed Name	xx	xx	1	2	3	4	5	6
			Better ————— Worse					

The information in this report reflects an ongoing significant data gathering, coordination and analysis effort by IDEM. Information sources include IDEM and many local, state and federal agencies. With each new year, we are closing the data gap to provide a more comprehensive picture of the state of Indiana's water quality.

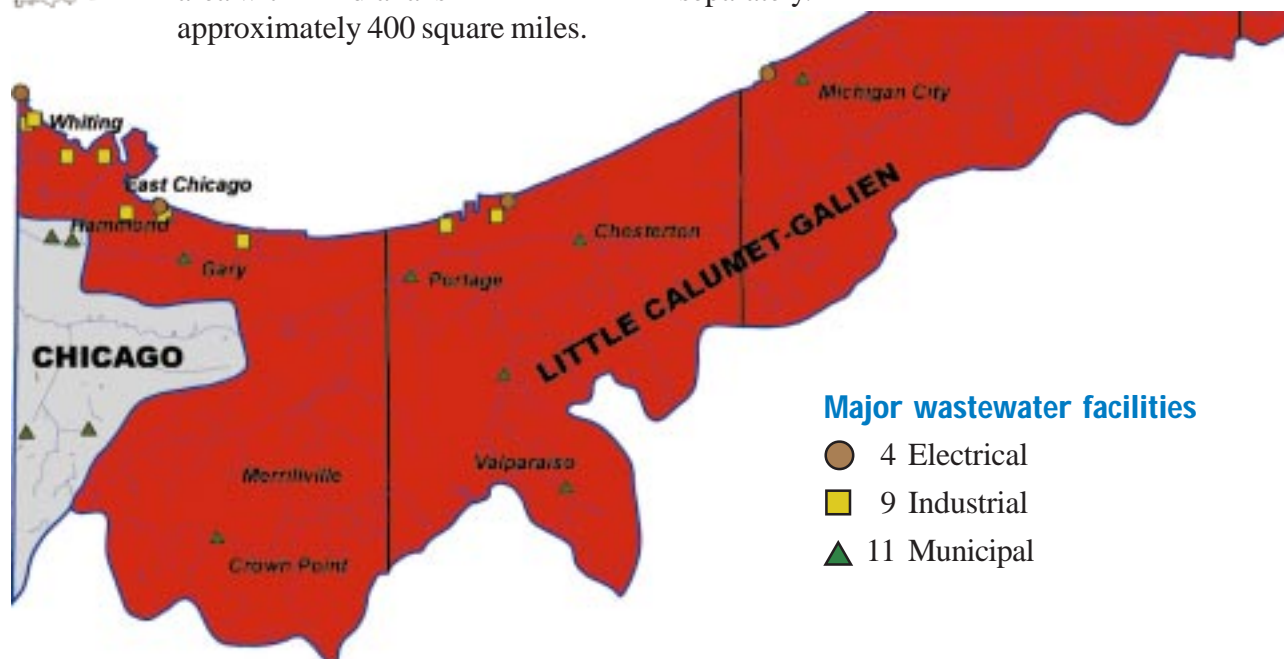
Overall basin quality is determined by using data from the Unified Water Assessment of Indiana Watersheds, the Surface Water Quality Monitoring Strategy and other data sources. Basin quality is rated on a scale of 1 to 6, with 1 being better quality and 6 being worse quality. Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Lake Michigan Basin (Northwest Indiana)



The Lake Michigan Basin is located in northwestern Indiana and drains portions of Lake, Porter and LaPorte counties. The drainage area within Indiana is approximately 400 square miles.

The Grand Calumet River-Indiana Harbor Ship Canal, Trail Creek and Little Calumet River are the major tributaries in the basin. For purposes of this evaluation, Lake Michigan was rated separately.



Basin quality rating*

Aquatic life support (26% assessed)

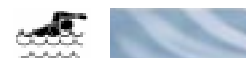


50%



50%

Recreational uses (25% assessed)



34%



66%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
Little Calumet-Galien	574	124		5	5
Chicago	40	4		5	NA

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

St. Joseph River Basin



The St. Joseph River Basin is located in northern Indiana and drains portions of Elkhart, Kosciusko, LaGrange, Noble, St. Joseph and Steuben counties. The drainage area within Indiana is approximately 1,800 square miles.

The St. Joseph, Elkhart and Little Elkhart rivers and Turkey and Pigeon creeks are the major tributaries in the basin.

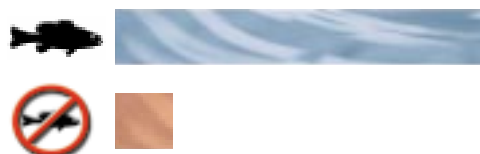


Major wastewater facilities

- 1 Industrial
- 8 Municipal

Basin quality rating*

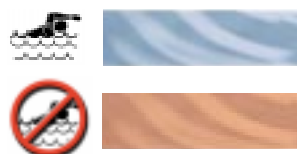
Aquatic life support (7% assessed)



86%

14%

Recreational uses (7% assessed)



47%

53%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
St. Joseph-Lake Michigan	1,350	101		4	5

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Maumee River Basin



The Maumee River Basin is located in northeastern Indiana and drains portions of Adams, Allen, DeKalb, Noble, Steuben and Wells counties. The drainage area within Indiana is approximately 1,200 square miles.

The Maumee, St. Joseph and St. Mary's rivers are the major tributaries in the basin.

Major wastewater facilities

- 2 Industrial
- ▲ 3 Municipal

Basin quality rating*

Aquatic life support (11% assessed)



71%



29%

Recreational uses (11% assessed)



81%



19%

Source: Indiana 303(d) List and 305(b) Update, 1998



Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
St. Joseph-Maumee	678	71		4	4
Upper Maumee	292	44		4	4
St. Mary's	337	37		4	5
Auglaize	117	0		NA	NA

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

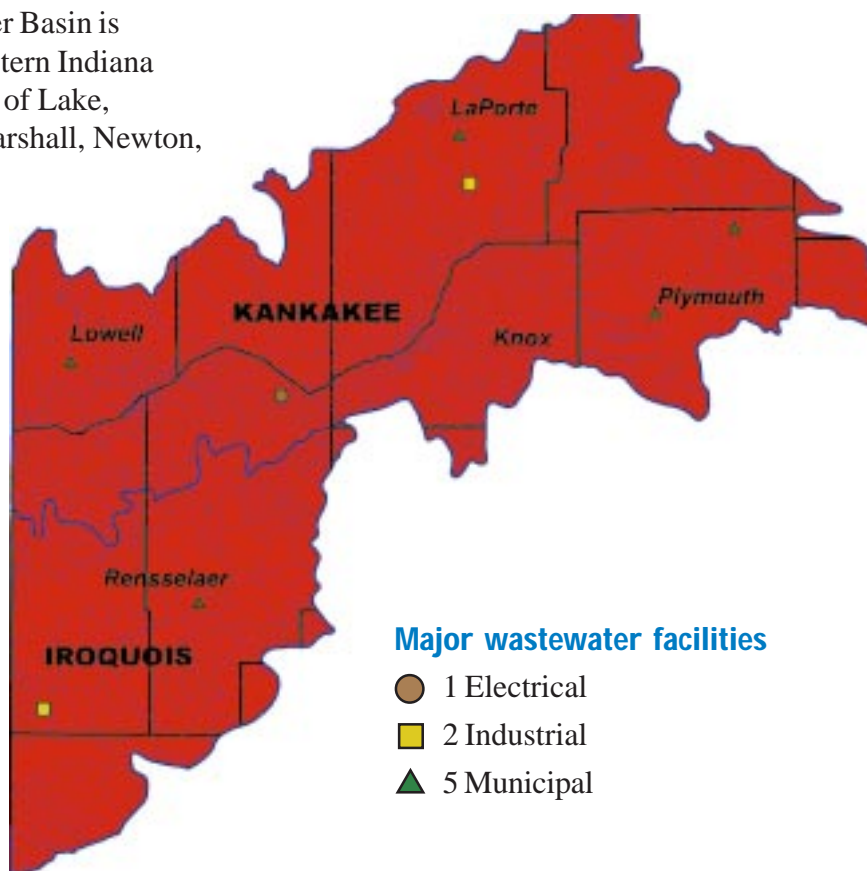
Source: Indiana 303(d) List and 305(b) Update, 1998

Kankakee River Basin



The Kankakee River Basin is located in northwestern Indiana and drains portions of Lake, Jasper, LaPorte, Marshall, Newton, Porter, Starke, and St. Joseph counties. The drainage area within Indiana is approximately 3,000 square miles.

The Kankakee, Iroquois and Yellow rivers are the major tributaries in the basin.



Basin quality rating*

Aquatic life support (3% assessed)



62%



38%

Recreational uses (3% assessed)



44%



56%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
Kankakee	2,646	94		4	5
Iroquois	857	4		3	5

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Upper Wabash River Basin



The Upper Wabash River Basin drains portions of 25 counties, including Fulton, Grant, Pulaski, Tippecanoe, Wabash, and White. The drainage area within Indiana is approximately

6,900 square miles.

Wildcat Creek and the Wabash, Tippecanoe, Eel and Salamonie rivers are the major tributaries in the basin.

Major wastewater facilities

- 4 Electrical
- ★ 1 Government
- 4 Industrial
- ▲ 18 Municipal



Basin quality rating*

Aquatic life support (14% assessed)



91%



9%

Recreational uses (0% assessed)



N/A



N/A

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
Eel-Wabash	757	101		4	4
Upper Wabash	968	255		4	3
Salamonie	359	119		3	4
Mississinewa	467	181		4	2
Tippecanoe	2,082	86		4	2
Middle Wabash-Deer	642	75		4	5
Wildcat	682	104		4	5

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Lower Wabash River Basin



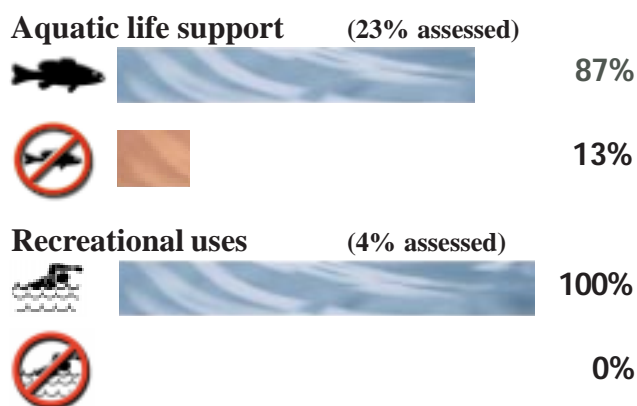
The Lower Wabash River Basin drains portions of 19 counties, including Montgomery, Clinton, Fountain and Vigo. The drainage area within Indiana is approximately 7,200 square miles.

The Wabash, Patoka and Little Vermilion rivers and Sugar and Busseron creeks are the major tributaries in the basin.

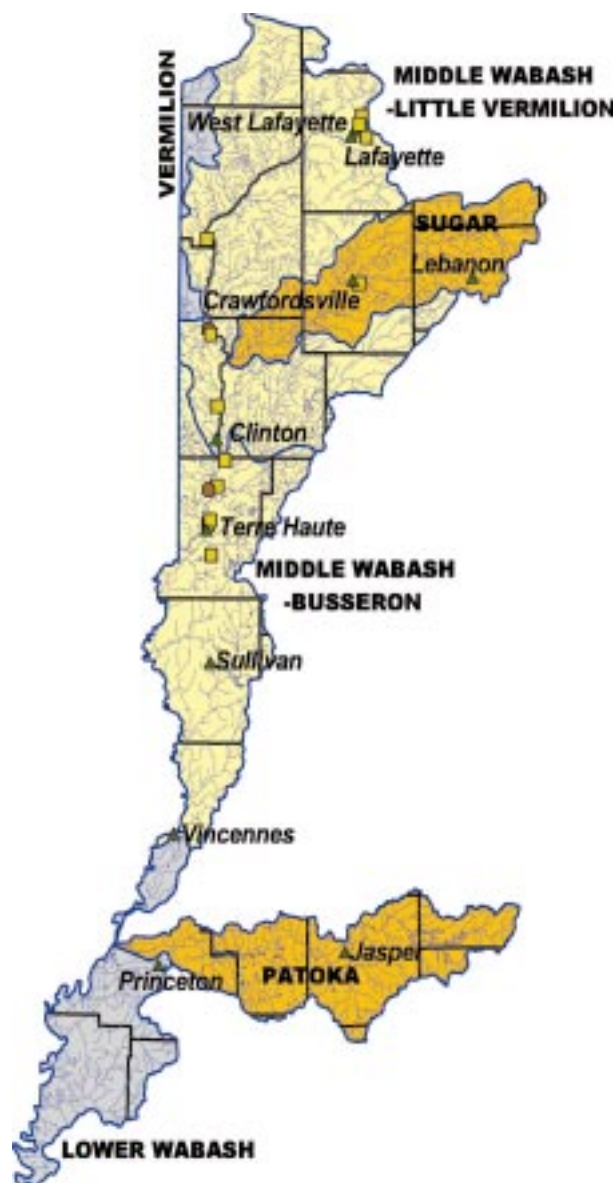
Major wastewater facilities

- 2 Electrical ▲ 10 Municipal
- 12 Industrial

Basin quality rating*



Source: Indiana 303(d) List and 305(b) Update, 1998



Watersheds assessment ranking

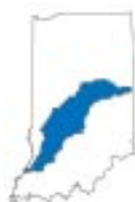
1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
M. Wabash-L. Vermilion	2,298	185		4	3
Sugar	840	93		4	4
M. Wabash-Busseron	795	100		4	3
Patoka	657	657		4	4
Vermilion	134	20		NA	NA
Lower Wabash	457	122		NA	NA

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

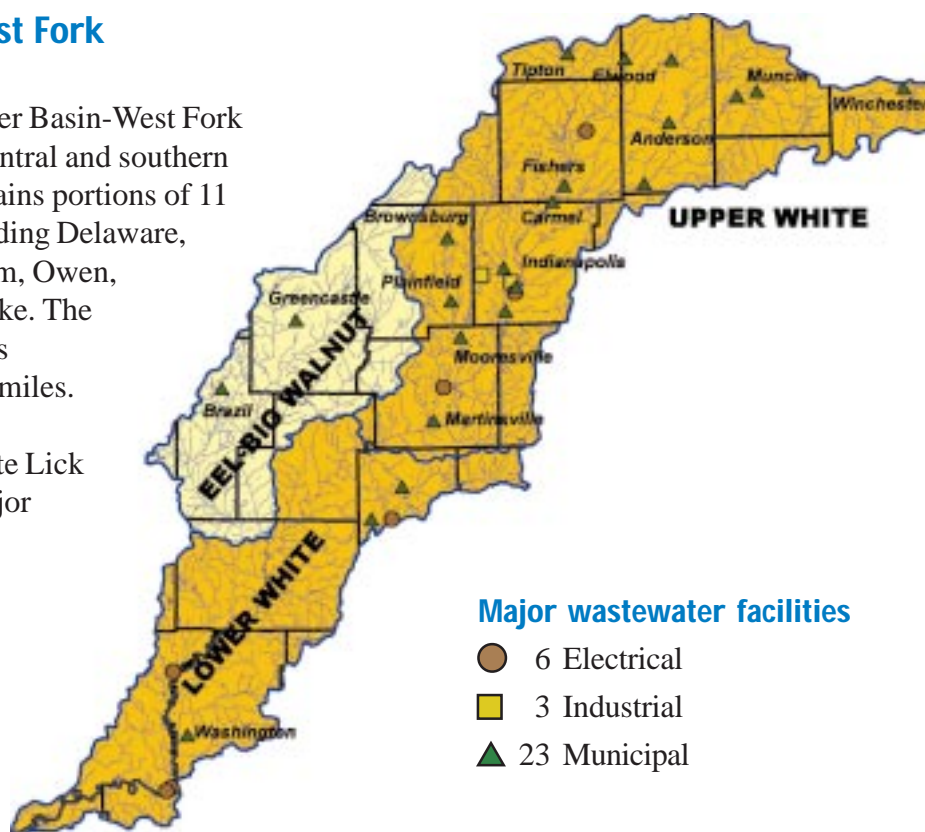
Source: Indiana 303(d) List and 305(b) Update, 1998

White River Basin - West Fork



The White River Basin-West Fork is located in central and southern Indiana and drains portions of 11 counties, including Delaware, Marion, Putnam, Owen, Daviess and Pike. The drainage area is approximately 5,600 square miles.

The Eel River and Fall, White Lick and Eagle creeks are the major tributaries in the basin.



Major wastewater facilities

- 6 Electrical
- 3 Industrial
- ▲ 23 Municipal

Basin quality rating*

Aquatic life support (100% assessed)



77%



23%

Recreational uses (77% assessed)



78%



22%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
Upper White	1,755	1,755		4	4
Eel-Big Walnut	794	794		3	3
Lower White	1,132	1,132		4	4

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

White River Basin - East Fork

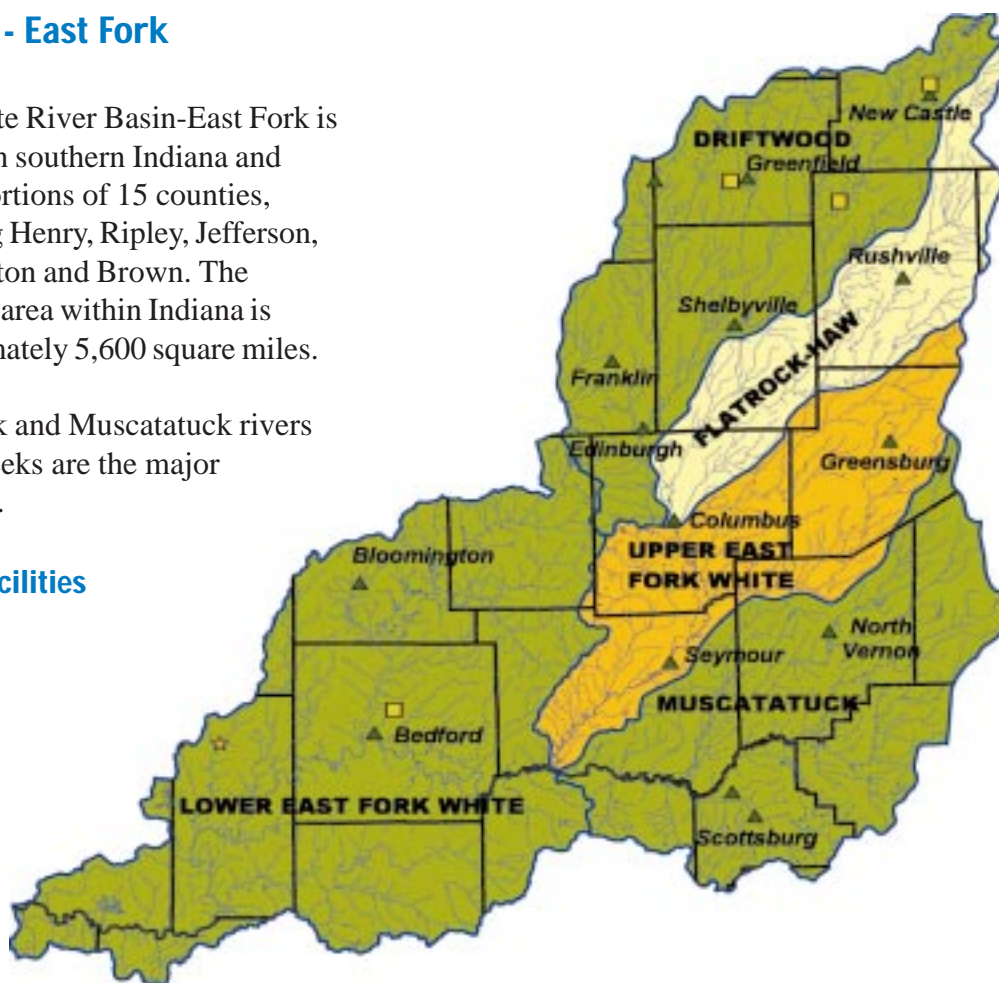


The White River Basin-East Fork is located in southern Indiana and drains portions of 15 counties, including Henry, Ripley, Jefferson, Washington and Brown. The drainage area within Indiana is approximately 5,600 square miles.

The Big Blue, Flatrock and Muscatatuck rivers and Salt and Sugar creeks are the major tributaries of the basin.

Major wastewater facilities

- ★ 1 Government
- 4 Industrial
- ▲ 15 Municipal



Basin quality rating*

Aquatic life support (15% assessed)



59%

41%

Recreational uses (1% assessed)



0%

100%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
Driftwood	787	226		3	2
Flatrock-Haw	457	52		3	3
Upper East Fork White	631	145		4	4
Lower East Fork White	1,403	182		4	2
Muscatutuck	953	62		3	2

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Ohio River Basin

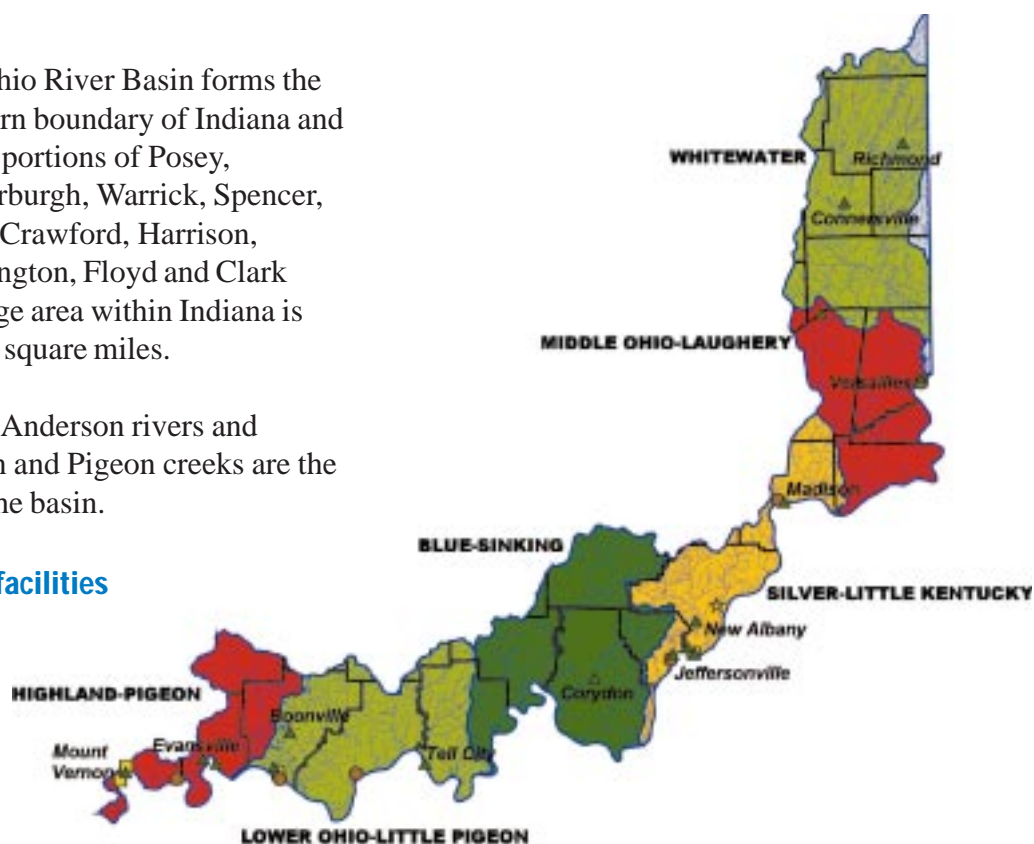


The Ohio River Basin forms the southern boundary of Indiana and drains portions of Posey, Vanderburgh, Warrick, Spencer, Perry, Crawford, Harrison, Washington, Floyd and Clark counties. The drainage area within Indiana is approximately 5,800 square miles.

The Ohio, Blue, and Anderson rivers and Laughery, Big Indian and Pigeon creeks are the major tributaries in the basin.

Major wastewater facilities

- 6 Electrical
- ★ 1 Government
- 5 Industrial
- ▲ 16 Municipal



Basin quality rating*

Aquatic life support (20% assessed)



87%



13%

Recreational uses (18% assessed)



60%



40%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better ————— Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
Whitewater	1,297	538	3	2
Middle Ohio-Laughery	719	0	NA	5
Silver-Little Kentucky	549	12	3	4
Blue-Sinking	862	78	3	1
Lower Ohio-Little Pigeon	773	5	4	2
Highland-Pigeon	389	42	4	5

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Indiana's rivers and streams

As of 1997, IDEM has assessed more than 40 percent of the state's total stream miles for the water's ability to support fish, shellfish and other aquatic life. A majority of that water was found to be supportive; however, a significant amount of Indiana stream miles was determined unsafe for swimming due to frequent high levels of *E. coli* bacteria.

Basin quality rating*

Aquatic life



78%

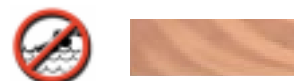


22%

Recreational uses



57%



43%

Indiana's lakes

IDEM has assessed nearly every acre of Indiana's lakes and reservoirs for their ability to support swimming and aquatic life. All Indiana lakes are designated for full body contact use and full aquatic life support. Nearly all lakes and reservoirs support their designated uses.

Basin quality rating

Aquatic life



98%



2%

Recreational uses



98%



2%

Lake Michigan

IDEM has assessed Lake Michigan for physical, chemical and biological information. Every mile fully supported recreational and aquatic life uses. Lake Michigan is designated for full body contact use and full aquatic life support.

Basin quality rating

Aquatic life



100%



0%

Recreational uses



100%



0%

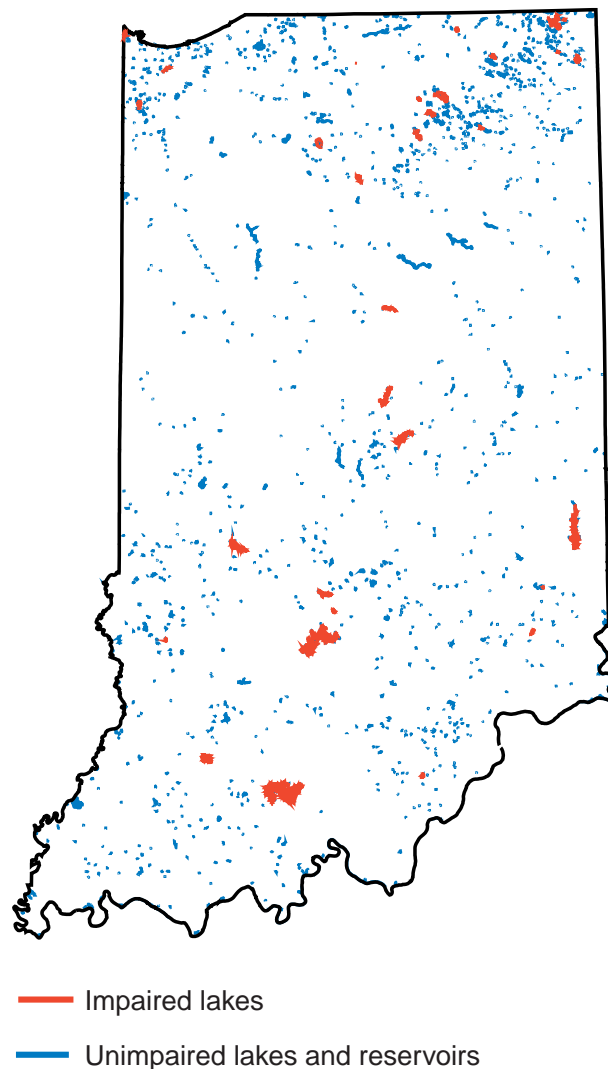
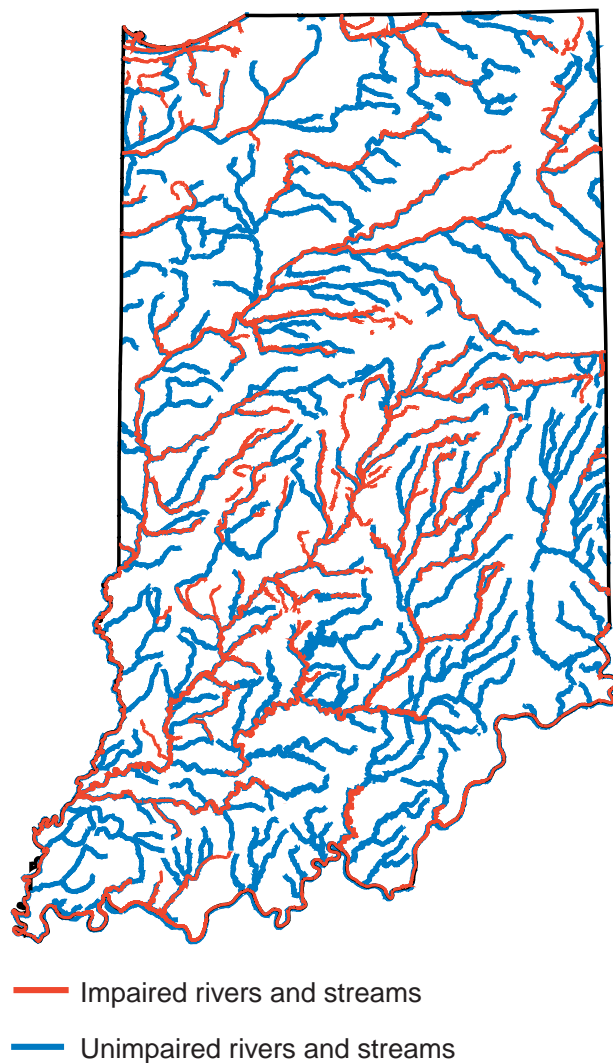
*Changes in basin quality ratings for Indiana's rivers and streams are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Indiana's impaired rivers and lakes

The maps show Indiana's 208 impaired rivers and lakes. In accordance with the Surface Water Monitoring Strategy, IDEM performs sampling, analysis and assessment of each basin once every five years.

The impaired rivers and lakes do not meet Indiana's water quality standards for designated uses or other natural resource goals, such as aquatic life support, fish consumption and recreational use.



Source: IDEM Office of Water Management, 1998

